MIDFACE DISTRACTION OSTEOGENESIS: A CASE REPORT

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INTRODUCTION

Treatment of midface hypoplasia in an adult patient is always a challenge. Rapid advances in orthognathic surgery have now made it possible to treat severe dentofacial deformities that were once only managed by orthodontic camouflage[1]. These cases were often compromised with unacceptable facial esthetics and unstable occlusal results. Over the past 25 years, there have been numerous advancements in technology and the surgical management of maxillary hypoplasia.

A number of surgical options for the treatment of midface hypoplasia are available but with certain limitations. Conventional osteotomies (Lefort 1 osteotomy[2], extended Lefort 1 osteotomies, and quadrangular midface osteotomies and even at higher levels involving Lefort II and III advancements) to correct severe craniofacial anomalies require long hospital stays, are at risk for infection and relapse, and the discomfort for the patient can be great. The placement of bone grafts to correct soft tissue or bony defects leads to donor site morbidity and produces unpredictable results. Nonvascularized grafts[3] are at risk for infection, and microvascular grafts have limited indication in such cases due to technical challenges and limited donor sites availability. The high rate of relapse, compromised function and aesthetics is due to the inability of the surrounding soft tissues to adapt to large skeletal movements. In the light of these limitations an alternate solution is to apply a gradual traction force to the bone segments using the technique of distraction osteogenesis, which is a biologic process of new bone formation between the surfaces of osteotomized bone segments that are separated gradually by incremental traction.[4]

Since the initial application of distraction osteogenesis to the human mandible by McCarthy, distraction osteogenesis has been used for gradual lengthening of the midface in children with syndromic craniosynostosis, cleft lip and palate[5], hemifacial microsomia, and midface hypoplasia from other causes. Both external and internal devices are available that permit midface distraction[6]. External distraction devices have the disadvantage of the residual cutaneous scars resulting from the surgical incision and the path of the expansion device.[7] Internal devices eliminate these problems of facial scarring, pin tract infections, and high visibility.

We present a case of midface hypoplasia in which the lefort I down fractured segment was advanced using the distraction osteogenesis technique. Informed written consent was obtained from the patient to present this case.

CASE REPORT

A 32 year old female resident of Muzzafarabad reported to oral and maxillofacial surgery department of Armed Forces Institute of Dentistry Rawalpindi in November 2009 with the complaints of difficulty in eating and facial asymmetry. Detailed history revealed that she had retained deciduous dentition which was confirmed on a panoramic radiograph. She had difficulty in biting as her lower jaw was placed more anteriorly as compared to the upper jaw. Family history revealed a similar finding in her sister who also had retained deciduous teeth but her facial asymmetry was not as severe. Her past medical, surgical and social history was insignificant.

A complete physical examination was carried out. General physical examination was unremarkable. Extra oral clinical examination revealed a concave profile with midface retrusion, mandiblular prognathism and pronounced genial prominence (Figure 1A). Intraoral examination showed satisfactory oral hygiene, full maxillary arch crossbite, attrition of dentition and multiple retained deciduous teeth. Due to mandibular overclosure the

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maxillary central incisors came into contact with the floor of mouth.

The patient was referred to the orthodontic and prosthodontic departments for consultation. The lateral cephalogram showed a long face with an increased Frankfort-mandibular plane angle (Figure 2A). The maxillo-mandibular relationship was skeletal Class III with 8mm of maxillary retrusion sagitally and a vertical discrepancy of 2mm. The mandible corpus length was in excess by 3mm. A multidisciplinary approach was employed and a two-phase treatment plan was suggested. The first option was to execute single stage Lefort I advancement and addressing the mandibular hyperplasia with reduction genioplasty to attain an acceptable camouflage. The second was to perform a Lefort I down fracture followed by fixation of distractor devices. After distraction of this segment, in next surgical phase, the distractor devices were removed and reduction genioplasty was performed. This followed by prosthodontic rehabilitation.

The treatment modalities were discussed in detail with the patient and she accepted these options. In stage 1, using maxillary vestibular incisions, a Lefort I down fracture osteotomy with complete mobilization was carried out. The osteotomy line was high enough to prevent damage to the dental roots. The distraction device was inserted by fixing the miniplate to the zygomatic bone (Figure 3A). Antibiotics, analgesics, and mouthwash were prescribed. Surgery was followed by a latency period of 5 days. The device was activated for 10 days at a rate of 1mm per day and a rhythm of 12 hours (Figure 3B). The distractors were left in place for two months to allow stabilization of the osteomotized segments. In the second phase of surgery, the devices were removed and a reduction genioplasty was performed. Patient was satisfied with the treatment out come (Figure 1B and 2B) and is currently undergoing prosthodontic rehabilitation.

DISCUSSION

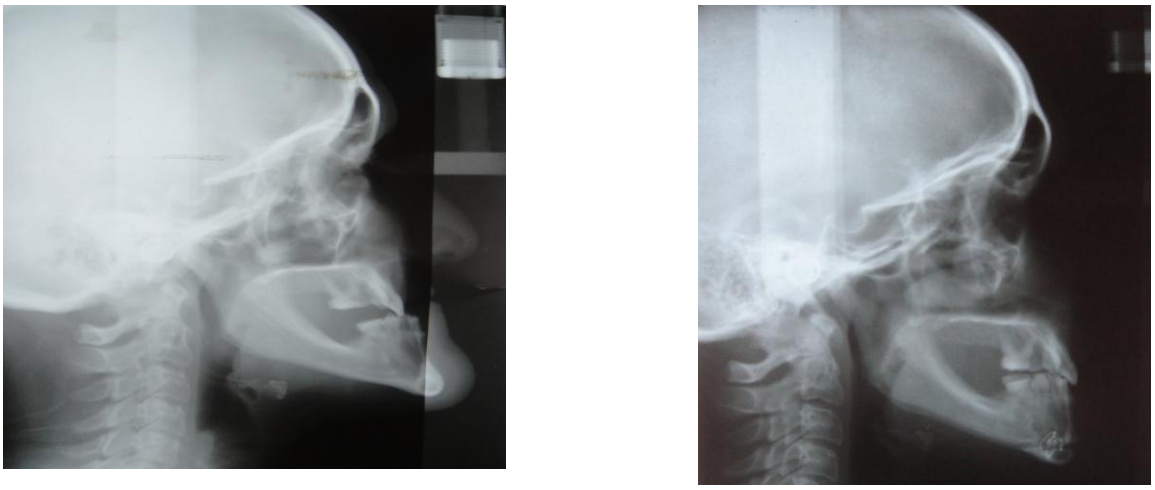
Concepts in craniofacial and maxillofacial surgery have evolved rapidly during recent decades for the correction of some deformities that were almost impossible to treat in the past. Maxillary hypoplasia is one such deformity which is characterized by deficiency of skeletal height, width, and anteroposterior relationships, which requires multidirectional correction. Patients with hypoplasia of the middle third of the face have a striking clinical appearance with flattening of the profile due to lack of development of the maxilla. In a growing child the use of face mask[8] and force application systems that attach elastic forces to the maxillary dentition has been used to correct midface deficiencies. However in adults the treatment of severe maxillary hypoplasia commonly presents a challenging situation. Detrimental psychological effects[9] depending on the physical deformity and the functional deficiencies especially mastication necessitates a surgical intervention. Several surgical techniques have been developed to advance the mid- face, including the Lefort I, LeFort II, the LeFort III and monobloc osteotomies. In these cases, vertical relapse ranging from 20% to 30% has been reported, even when internal rigid plate fixation is used in combination with interpositional bone grafts.

Today, the use of Distraction Osteogenesis in the craniofacial area is a viable treatment alternative in cases where conventional osteotomy techniques are inefficient or where relapse occurs with extreme bone movements. Distraction osteogenesis of the maxilla is one of the treatment options that can be used in severe maxillary hypoplasia. In this process, the maxilla is distracted from the complete Le Fort I osteotomy line and the pterygomaxillary disjunction.

The first applications of Distraction Osteogenesis were made with extraoral devices according to Ilizarov's principles; but because of these applications, the clinician was faced with problems such as external scarring, facial nerve damage, inferior alveolar nerve damage, and social problems. The use of internal devices offer the multiple benefits over the extraoral devices including elimination of skin scarring caused by translation of transcutaneous fixation pins; improved patient compliance during the

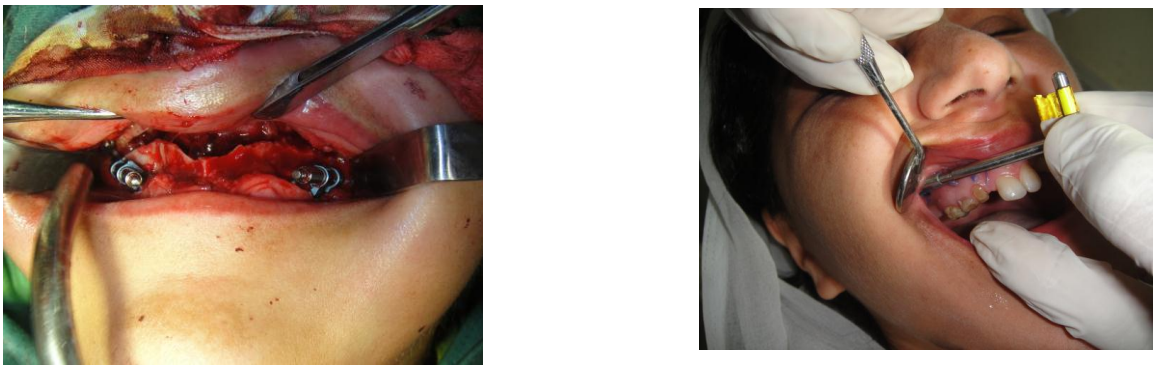
A B

Fig 1: Profile view of patient (A) preoperative and (B) postoperative. Note the remarkable improvement in midface and soft tissue profile.



A B

Fig 2: Lateral cephalogram of patient (A) preoperative and (B) postoperative. Maxillary advancement and genium set back is clearly discernable.



A B

Fig 3: (A) Per operative picture of Lefort 1 downfracture and intraoral distractor devices in place (B) The distractor device being activated.

consolidation phase; and improved stability of the attachment of the device to the bone.[7]

This case presented also was distracted using an internal distraction device. The precise positioning of the device was technique sensitive but it yielded better results and increased acceptance by our patient. We placed two intra oral distractor devices fixated with

miniplates at the zygomatic buttress as it is strong enough to secure the device. The maxilla was overcorrected to counter for relapse. To minimize the risk of relapse the retention or consolidation phase should be as long as possible to increase the period for mineralization of the newly formed bone. The length of this period is controversial[10] and depends on the exact location of the osteotomy line and the quality of bone distracted. Extraoral devices cannot easily be kept in place for such a long time because of the difficulty of psychological acceptance, and the necessity to participate in social activities. The disadvantages of the technique described here include limited three dimensional control and the need for a second procedure to remove the device. The cost of the device is only a minor disadvantage when compared to the combine cost of donor site surgery, patient compliance and disfiguring facial scarring. Careful surgical technique is able to avoid the complications in the adjacent teeth. Gradual distraction of the segment might be advantageous to the blood supply of the mobilized segment.

We were not faced with any abnormal responses related to the hard and the soft tissues. We did not observe more movement of the teeth than osseous tissues and normal overjet and overbite was obtained. The device was well tolerated by the patient. The case has been under follow-up.

CONCLUSION

A case with maxillary deficiency was successfully treated using distraction osteogenesis. A skeletal Class I relationship with a positive overjet was obtained. The treatment result was stable without any complications.

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